Remarks

The present amendment responds to the final Official Action mailed June 4, 2003. The Official Action objected to Fig. 7 and required that the figure be split into two separate drawing Figs. 7A and 7B and be designated as prior art. The Official Action required the submission of a substitute specification in proper idiomatic English. The Official Action rejected the claims under 35 U.S.C. § 112 as assertedly narrative and indefinite. The Official Action rejected claim 7 under 35 U.S.C. § 112 as assertedly indefinite for failure to particularly point out and distinctly claim the subject matter of the invention. The Official Action objected to claims 5-9 and 12 as assertedly duplicative over claims 1-4 and 11.

The Official Action rejected claims 10 and 13 under 35 U.S.C. §102 based on "applicant's admitted prior art". The Official Action rejected claims 1, 2, 5-7, 11, 12, 14 and 15 under 35 U.S.C. §103 based on "applicant's admitted prior art" in view of Pye, Injection Moulding Design, Kent, Great Britain, George Goodwin Publishers 1978, pp. 236 and 237, TP1150P91978 (Injection Molding Design). The Official Action rejected claims 3 and 8 under 35 U.S.C. §103 based on "applicant's admitted prior art" in view of Injection Molding Design and Japanese Patent Publication No. 2-28134 dated 07/27/1990 (Japan 2-28134). The Official Action rejected claims 4 and 9 under 35 U.S.C. §103 based on "applicant's admitted prior art" in view of Injection Molding Design and German OLS 3932248A1 dated 4/5/1990 (Germany 3932248).

These grounds of rejection are addressed below following a brief discussion of the present invention to provide context. Claims 2, 4, 5, and 10-15 have been amended to be more clear and distinct. Claims 7-9 have been cancelled without prejudice. Claims 1-6 and 10-15 are presently pending.

The Present Invention

In one exemplary embodiment according to the present invention as defined in claim 1 and shown, for example, in Figs. 1-3, a resin piston for a master cylinder is provided, comprising: a through-hole through which a stopper pin being a component of a valve mechanism of the master cylinder is inserted, a concavity in which the valve mechanism is fixed by being inserted therein, and a communicating hole communicating with the through-hole from the concavity, the resin piston for a master cylinder being molded by injection of a resin material; and a burr generated by a flow of the resin material into a gap between a combined molding die and a core in a process of molding of the resin piston by injection molding, the burr projecting out from the communicating hole into the through-hole.

In another exemplary embodiment according to the present invention as defined in claim 2 and shown, for example, in Fig. 5, such a resin piston for a master cylinder is provided, in which a groove is provided in a portion of an inner wall surface of the through-hole, the groove facing the communicating hole, the groove being in the shape of a flat surface oriented in a direction substantially perpendicular to the longitudinal direction in which the stopper pin travels in operation of the master cylinder.

In a further exemplary embodiment according to the present invention as defined in claim 11 and shown, for example, in Figs. 1-3, a master cylinder equipped with a resin piston is provided, the resin piston for a master cylinder comprising: a through-hole through which a stopper pin being a component of a valve mechanism of the master cylinder is inserted, a concavity in which the valve mechanism is fixed by being inserted therein, and a communicating hole communicating with the through-hole from the concavity, the resin piston for a master cylinder being molded by injection of a resin material, a burr generated by a flow of the resin

material into a gap between a combined molding die and a core in a process of molding of the resin piston for a master cylinder by injection molding, the burr projecting out from the communicating hole into the through-hole.

Further exemplary embodiments according to the present invention provide dies for molding resin pistons and methods for manufacturing resin pistons.

The Claim Rejections Under 35 U.S.C. § 112

The claims were rejected on page 3 of the Official Action under 35 U.S.C. § 112 as being assertedly narrative and indefinite, including a specific rejection as to claim 7. These rejections are respectfully traversed in view of the discussion below.

Claims 2, 4, 5, and 10-15 have been amended to be more clear and distinct. Claims 7-9 have been cancelled without prejudice. The objection to the recitation in claim 2 of "a groove making said inner wall surface nearby a part" is obviated by the amendments now made to claim 2. Claim 2 now recites, "The resin piston for a master cylinder of claim 1, wherein a groove is provided in a portion of an inner wall surface of said through-hole, the groove facing said communicating hole, the groove being in the shape of a flat surface oriented in a direction substantially perpendicular to the longitudinal direction in which said stopper pin travels in operation of said master cylinder."

Claim 7 has been cancelled without prejudice. Accordingly, the rejection of claim 7 under 35 U.S.C. § 112, second paragraph, is moot.

The Objection Regarding Double Patenting

The Official Action objected on page 3 to claims 5-9 and 12 under 37 C.F.R. § 1.75 as assertedly being a substantial duplicate of claims 1-4 and 11. Claim 5 has been amended to depend from and recite limitations in addition to claim 1. Claim 6 depends from amended claim 5. Claims 7-9 have been cancelled without prejudice. Claim 12 has been amended to depend from and recite limitations in addition to those found in claim 11. The double patenting objection accordingly is obviated as to claims 5, 6 and 12, and moot as to claims 7-9.

Section 102 Rejection

Claims 10 and 13 were rejected under 35 U.S.C. § 102(b) based on "applicant's admitted prior art". This rejection is respectfully traversed as addressed in detail below.

The Official Action clarifies at page 2 that the expression "applicant's admitted prior art" refers to the subject matter of Fig. 7 which has now been split into Figs. 7A and 7B. Applicants acknowledge that Figs. 7A and 7B show prior art. However, Figs. 7A and 7B do not support the Official Action's analysis, and Applicants expressly traverse and deny any asserted admission regarding the Official Action's various characterizations of Figs. 7A and 7B.

Figs. 7A and 7B, as discussed in the specification at pages 2 and 3, show a communicating hole 32 of a resin piston for a master cylinder 1 that is molded by injection molding using dies 11 and 12, and using cores 13 and 14. Burrs are formed at a communicating section 51 in a direction to cover the communicating hole 32 along a surface at which the upper die 11 and the lower die 12 are touched with the core for molding a concavity 13. The burrs are formed because the resin material flows into small gaps between the surfaces at which the upper die 11 and the lower die 12 are touched to the core for molding a concavity 13 in the process of

the molding of the resin piston for a master cylinder 1. When the burrs are scraped off after injection molding, the resin surfaces at the places where the burrs have been scraped off become roughened and the stem 42 may be caught by the roughened surfaces. Ultimately, the stem 42 may become unmovable because the stem 42 is caught by the burrs and then the valve mechanism 41 becomes impossible to work or works unsatisfactorily. This admittedly prior art approach does not meet and does not make obvious the present claims, which define arrangements that address the problems with such prior art approach.

Claims 10 and 13 have been amended to be more clear and distinct. Claim 10 now depends from claim 5, which now depends from claim 1. Claim 13 now depends from claim 11. These amendments render moot the rejection of claims 10 and 13 under 35 U.S.C. § 102.

Section 103 Rejections

Claims 1, 2, 5-7, 11, 12, 14 and 15 were rejected under 35 U.S.C. § 103 based on "Applicant's admitted prior art" in view of Injection Molding Design. Claims 2, 4, 5, and 10-15 have been amended to be more clear and distinct. Applicants respectfully traverse this rejection and request that it be withdrawn, in view of the discussion above and the further comments below.

As discussed above, the subject matter of the "admitted prior art" relied upon by the Official Action, now Figs. 7A and 7B, fails to disclose and fails to suggest the subject matter of the present invention as defined in claims 1, 5, 10, 11 and 13. As amended, claims 10 and 13 both recite that "a groove is provided in a portion of an inner wall surface of said through-hole, the groove facing said communicating hole, the groove being in the shape of a flat surface oriented in a direction substantially perpendicular to the longitudinal direction in which said

stopper pin travels in operation of said master cylinder." The groove 34 is shown, for example, in Fig. 5, which shows that the groove is provided in a portion of an inner wall surface of the through-hole 33. The groove 34 faces the communicating hole 32. The specification explains at page 15, for example, that "[t]he groove 34 is formed in such a way that the inner wall surface of the through-hole 33 becomes flat at a part thereof nearby a position where the communicating hole 32 communicates with the through-hole 33 in the direction of the insertion of the stopper pin 43." Fig. 5 shows that the flat surface is oriented in a direction that is substantially perpendicular to the longitudinal direction in which the stopper pin 43 travels in operation of the master cylinder.

Figs. 7A and 7B fail to disclose and fail to suggest the present invention as defined in claim 10. For example, Figs. 7A and 7B fail to disclose and fail to suggest, as recited in independent claim 1, a resin piston in which "...a burr generated by a flow of said resin material into a gap between a combined molding die and a core in a process of molding of said resin piston by injection molding, said burr projecting out from said communicating hole into the through-hole." Figs. 7A and 7B further fail to disclose and fail to suggest, as recited in dependent claim 5 on which claim 10 depends for example, a resin piston in which "a portion of said resin piston where said through-hole communicates with said communicating hole is molded in a manner such that an end of said core for molding said concavity is impacted in an impact hole formed in said core for through-hole molding to produce a burr projecting out from the communicating hole into the through-hole."

Burrs generated by the molding die and core shown in Figs. 7A and 7B are formed flush with the end of the core 13 and flush with the adjacent portion of the resin piston formed by the core 13. Such burrs do not and cannot project out from said communicating hole into the

through-hole. In contrast, as shown for example in Figs. 3A and 3B according to the present invention, the core 13 passes beyond the adjacent portion of the resin piston formed by the core 13. The communicating section 51 shown in Fig. 3B plainly shows that burrs are formed during the injection molding process which project out from said communicating hole into the through-hole.

Figs. 7A and 7B further fail to disclose and fail to suggest, as recited in claim 10 itself for example, a resin piston in which a groove is provided in a portion of an inner wall surface of said through-hole, the groove facing said communicating hole, the groove being in the shape of a flat surface oriented in a direction substantially perpendicular to the longitudinal direction in which said stopper pin travels in operation of said master cylinder. Figs. 7A and 7B merely show a cutaway view of a through-hole. The Official Action refers on page 2 to Figs. 1 and Figs. 7A and 7B and asserts that the through-holes depicted have similar shapes. However, the through-hole 33 shown in Fig. 5, discussed above in connection with claim 10, has a groove 34 that certainly is not shown in Figs. 7A and 7B.

Figs. 7A and 7B also fail to disclose and fail to suggest the present invention as defined in claim 13. For the reasons stated above for example, Figs. 7A and 7B fail to disclose and fail to suggest, as recited in independent claim 11 upon which claim 13 depends, a master cylinder comprising a burr generated by a flow of said resin material into a gap between a combined molding die and a core in a process of molding of said resin piston for a master cylinder by injection molding, said burr projecting out from said communicating hole into the through-hole. Furthermore for the reasons stated above, Figs. 7A and 7B fail to disclose and fail to suggest, as recited in claim 13 itself, a master cylinder in which a groove is provided in a portion of an inner wall surface of said through-hole, the groove facing said communicating hole, the groove being

in the shape of a flat surface oriented in a direction substantially perpendicular to the longitudinal direction in which said stopper pin travels in operation of said master cylinder. Claim 6 depends from claim 5. The rejection as to claim 7 is moot as that claim has been cancelled without prejudice.

Figs. 7A and 7B further fail to disclose and fail to suggest the subject matter of claim 2, which recites for example, that "...a groove is provided in a portion of an inner wall surface of said through-hole, the groove facing said communicating hole, the groove being in the shape of a flat surface oriented in a direction substantially perpendicular to the longitudinal direction in which said stopper pin travels in operation of said master cylinder." The Official Action asserts on page 4 that "...the concavity and communication hole is formed by a concavity core (13) abutting a flat surface of the corresponding cores (see detail of fig 7); wherein a groove forming an inner wall surface of the through hole, near the communication hole, has a flat surface..." However, no groove is shown in Figs. 7A and 7B, provided in a portion of an inner wall surface of a through-hole, the groove facing a communicating hole, the groove being in the shape of a flat surface oriented in a direction substantially perpendicular to the longitudinal direction in which a stopper pin travels in operation of a master cylinder.

Figs. 7A and 7B fail to disclose and fail to suggest the subject matter of claim 12, dependent from claim 11, which recites for example that "a portion of said resin piston where said through-hole communicates with said communicating hole is molded in a manner such that an end of said core for molding said concavity is impacted in an impact hole formed in said core for through-hole molding to produce a burr projecting out from the communicating hole into the through-hole." As discussed above, Figs. 7A and 7B fail to disclose and fail to suggest such a

burr. Furthermore, Figs. 7A and 7B fail to disclose and fail to suggest such an impact hole. An exemplary impact hole 16 is shown in Fig. 3. There is no such impact hole in Figs. 7A and 7B.

Figs. 7A and 7B fail to disclose and fail to suggest the subject matter of claim 14, directed to a die for molding a resin piston for a master cylinder, which is so constructed for example such that a portion of said resin piston where said through-hole communicates with said communicating hole is molded in a manner such that an end of said core for molding said concavity is impacted in an impact hole formed in said core for through-hole molding to produce a burr projecting out from the communicating hole into the through-hole.

Figs. 7A and 7B fail to disclose and fail to suggest the subject matter of claim 15, directed to a method for manufacturing a resin piston for a master cylinder, which for example comprises the steps of molding a portion of said resin piston where said through-hole communicates with said communicating hole in a manner such that an end of said core for molding said concavity is impacted in an impact hole formed in said core for through-hole molding to produce a burr projecting out from the communicating hole into the through-hole.

The Official Action admits on page 4 that the concavity core 13 shown in Figs. 7A and 7B abuts a flat surface of the corresponding cores. This statement refers to the communicating section 51 shown in Fig. 7B where the end of the concavity core 13 meets the corners of upper die 11 and lower die 12. The Official Action adds that Figs. 7A and 7B do not disclose that the concavity core is inserted into an impact hole in the corresponding cores. The Official Action accordingly admits that Figs. 7A and 7B fail to disclose and fail to suggest the subject matter of any of claims 5, 6, 12 and 14, all of which recite, for example, that "a portion of said resin piston where said through-hole communicates with said communicating hole is molded in a manner such that an end of said core for molding said concavity is impacted in an impact hole formed in

said core for through-hole molding to produce a burr projecting out from the communicating hole into the through-hole."

The Official Action attempts to remedy the admitted defects in Figs. 7A and 7B as a reference against claims 5, 6, 12 and 14 by combining Injection Molding Design with it. Injection Molding Design does not remedy such defects. Fig. 9.5(a) on page 236 of Injection Molding Design shows a cross sectional view, indicated in solid black, of the component to be injection molded by the teachings of this reference. The component is formed using a single core, labeled "exposed core" in the upper right drawing within Fig. 9.5. As shown in Fig. 9.6(b) and explained on page 237, this single core and the injection mold can be protected from damage by constructing the die in a manner so that the core longitudinally slides into and out of position. Fig. 3 according to the present invention shows an exemplary resin piston for a master cylinder 1, together with dies and cores for injection molding of the resin piston. The cores employed comprise a core for molding a concavity 13 and a core for through-hole molding 15. The latter core is formed by integration of the upper die 11 and the lower die 12 in the manner as shown for example in Figs. 1 and 2. The resulting resin piston comprises a concavity 31, a communicating hole 32, and a through hole 33. The concavity 31 and the communicating hole 32 together are molded by the core for molding a concavity 13. The through-hole 33 is molded by the core for through-hole molding 15. The core for through-hole molding 15 includes an impact hole 16, in which a tip of the core for molding a concavity 13 is impacted.

Injection Molding Design shows and discusses a single injection molding core. The component produced by use of the injection mold in Injection Molding Design has a single concavity. Injection Molding Design accordingly fails to disclose and fails to suggest the subject matter of any of the pending claims.

Injection Molding Design presents a generic discussion of injection molding. Injection Molding Design nowhere makes reference to resin pistons or master cylinders. Accordingly Injection Molding Design is not from applicants' field of endeavor. Injection Molding Design discloses a single core, shown in Fig. 9.6. In this regard, the teachings of Injection Molding Design are incompatible with Figs. 7A and 7B. However, even granting the combination of Injection Molding Design's teachings with Figs. 7A and 7B in the manner proposed by the Official Action fails to disclose and fails to suggest the subject matter of any of the pending claims, for the reasons stated above. The Official Action purports to cite Injection Molding Design as disclosing that a tip of a core is inserted into an impact hole of a die, for the purpose of preventing the core from damage. This purpose of Injection Molding's teachings, to prevent damage to injection molding cores, is nowhere stated in the present application. Injection Molding Design fails to disclose and fails to suggest an injection molding die having the multiple cores defined in the pending claims. Injection Molding Design fails to disclose and fails to suggest an injection molded component having the multiple concavities defined in the pending claims.

Contrary to the assertion in the Official Action at page 2, the combination of Figs. 7A and 7B and Injection Molding Design would not result in a burr projecting out from the communicating hole into the through hole. Injection Molding Design discloses only one hole, created by the solitary core shown in Fig. 9.6.

Applicants acknowledge and agree with the Official Action's admission on page 2 that neither Figs. 7A and 7B, Injection Molding Design, Japan 2-28134, nor Germany 3932248 discloses that a burr projects out from a communicating hole into a through hole.

Claims 3 and 8 were rejected under 35 U.S.C. § 103 based on "Applicant's admitted prior art", which is Figs. 7A and 7B of the present application, in view of Injection Molding Design and Japan 2-28134. Applicants respectfully traverse this rejection and request that it be withdrawn, in view of the discussion above and the further comments below.

Claim 3 depends from claim 2. Figs. 7A and 7B and Injection Molding Design, taken alone or in combination, fail to disclose and fail to suggest the subject matter of the present invention as defined in claim 2 for the reasons given above, which will not be further restated here. Such references accordingly also fail to disclose and fail to suggest the subject matter of the present invention as defined in claim 3. The Official Action admits at page 4 that these references do not disclose a groove having a width that is narrower than that of a through-hole. The rejection as to claim 8 is moot as that claim has been cancelled without prejudice.

Japan 2-28134, taken alone or together with Figs. 7A and 7B and Injection Molding Design, fails to disclose and fails to suggest the invention as defined in pending claim 3. The figures of Japan 2-28134 show a resin piston and master cylinder. However, Japan 2-28134 fails to disclose and fails to suggest a resin piston as defined in claim 1, comprising a burr generated by a flow of resin material into a gap between a combined molding die and a core in a process of molding of said resin piston by injection molding, said burr projecting out from said communicating hole into the through-hole.

Fig. 2 of Japan 2-28134 shows a flat surface 15c against which the stop pin 22 may rest. Claim 2 according to the present invention on which claim 3 depends, recites a groove in a portion of an inner wall surface of the through-hole, the groove facing the communicating hole. Surface 15c is not a groove in the inner wall surface, but rather is the inner wall surface itself. Accordingly, Japan 2-28134 taken alone or in combination with Figs. 7A and 7B and Injection

Molding Design fails to disclose and fails to suggest a resin piston for a master cylinder as defined in claim 2, wherein a groove is provided in a portion of an inner wall surface of said through-hole, the groove facing said communicating hole, the groove being in the shape of a flat surface oriented in a direction substantially perpendicular to the longitudinal direction in which said stopper pin travels in operation of said master cylinder.

Claim 3 according to the present invention recites a resin piston for a master cylinder as in claim 2, wherein a width of said groove is narrower than that of said through-hole and wider than a diameter of said stopper pin. Japan 2-28134 fails to disclose and fails to suggest a resin piston comprising a groove as defined in claim 2. Therefore, the discussion of the width of the purported groove in Japan 2-28134 is moot.

Claims 4 and 9 were rejected under 35 U.S.C. § 103 based on "Applicant's admitted prior art", which is Figs. 7A and 7B of the present application, in view of Injection Molding Design and Germany 3932248. Applicants respectfully traverse this rejection and request that it be withdrawn, in view of the discussion above and the further comments below.

Claim 4 depends from claim 1. Figs. 7A and 7B and Injection Molding Design, taken alone or in combination, fail to disclose and fail to suggest the subject matter of the present invention as defined in claim 1 for the reasons given above, which will not be further restated here. Such references accordingly also fail to disclose and fail to suggest the subject matter of the present invention as defined in claim 4. The rejection as to claim 9 is moot as that claim has been cancelled without prejudice.

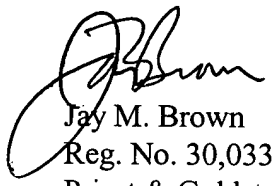
Germany 3932248 discloses a master cylinder piston. However, Germany 3932248 fails to disclose and fails to suggest a resin piston as defined in claim 1, comprising a burr generated by a flow of resin material into a gap between a combined molding die and a core in a process of

molding of a resin piston by injection molding, the burr projecting out from said communicating hole into the through-hole. Taken together, Figs. 7A and 7B, Injection Molding Design and Germany 3932248 therefore fail to disclose and fail to suggest a resin piston as defined in claim 1. Accordingly, the discussion on page 5 of the Official Action regarding Germany 3932248 as applied to claim 4, is moot.

Conclusion

All of the presently pending claims, as amended, appearing to define over the applied references, withdrawal of the present rejections and prompt allowance are requested.

Respectfully submitted,



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RESIN PISTON FOR MASTER CYLINDER IN BRAKE SYSTEM, MASTER CYLINDER, DIE FOR MOLDING RESIN PISTON FOR MASTER CYLINDER, AND ~~MANUFACTURING~~ METHOD OF MANUFACTURING RESIN PISTON FOR MASTER CYLINDER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a resin piston for ~~being mounted~~ mounting in a master cylinder in a brake system used for a vehicle and the like, for transforming brake treading force into a fluid pressure to operate a brake mechanism formed in each wheel~~,~~. ~~and~~ The invention further relates to the master cylinder, a die for molding the resin piston for the master cylinder, and a ~~manufacturing~~ method of the manufacturing resin piston for the master cylinder.

2. Description of the Related Art

As the prior art concerning such ~~a kind~~types of ~~a~~ resin pistons for a master cylinder, a resin piston for a master cylinder can be cited that is disclosed in Japanese Utility Model Publication No. Hei. 2-28134 and Japanese Laid-Open Patent Publication No. 2000-159088. When such a resin piston for a master cylinder is molded by injection molding, as shown in Fig. 7 of the present specification, an upper die 11 and a lower die 12, and a core for molding a concavity 13 and a core 14 are combined, and then a resin material is injected through a resin material injection hole 21 formed in the core 14. Then, after the resin material has been solidified, the core for molding a concavity 13 and the core 14 are pulled out, and the upper die 11 and the lower die 12 are removed. Thus, a resin piston for a master cylinder 1 is molded.

In the resin piston for a master cylinder 1 molded in such a way, as shown in Fig. 2, a valve mechanism 41 is fixed in a concavity 31 of the resin piston for a master cylinder 1 in a state such that a stem 42, being a part of the valve mechanism 41, is inserted into a communicating hole 32. The valve mechanism 41 opens its valve in a state such that the stem 42 is touched to a stopper pin 43 disposed in the through-hole 33 of the resin piston for a master

cylinder 1, and closes the valve in a state such that the stem 42 is separated from the stopper pin 43.

In the communicating hole 32 of the resin piston for a master cylinder 1 that is molded by injection molding using the dies 11, 12 and the cores 13, 14 shown in Fig. 7, burrs are formed at a communicating section 51 in a direction to cover the communicating hole 32 along a surface at which the upper die 11 and the lower die 12 are touched with the core for molding a concavity 13. The burrs are formed because the resin material flows into small gaps between the surfaces at which the upper die 11 and the lower die 12 are touched to the core for molding a concavity 13 in the process of the molding of the resin piston for a master cylinder 1. The generation of the burrs depends on the precision of the dies, but it is very difficult to eliminate the generation of the burrs completely. Moreover, also in the case where glass fibers are mixed with the resin material with the object of ~~the increase of~~ increasing the strength of the resin piston for a master cylinder 1, it is difficult to eliminate ~~generated~~ generation of burrs because it is apprehended that, when the burrs are scraped off after injection molding, the resin surfaces at the places where the burrs have been scraped off become roughened and the stem 42 is caught by the roughened surfaces. Then, a problem is generated such that the stem 42 becomes unmovable because the stem 42 is caught by the burrs and then the valve mechanism 41 becomes impossible to work.

SUMMARY OF THE INVENTION

One object of the present invention is to provide a resin piston for a master cylinder capable of preventing a valve mechanism from becoming impossible to work because the stem of the valve mechanism is caught by burrs generated in the communicating hole of the resin piston for a master cylinder in the process of the injection molding thereof.

For attaining the object, a first aspect of the present invention is a resin piston for a master cylinder including a through-hole through which a stopper pin, being a component of a valve mechanism of the master cylinder, is inserted, a concavity in which the valve mechanism is fixed by being inserted therein, and a communicating hole communicating with the through-hole from the concavity, the resin piston for a master cylinder being molded by the injection of a resin

material, wherein ~~a position of~~ a burr to be generated by a flow of the resin material into a gap between a combined molding die and a core in a process of molding of the resin piston for a master cylinder by injection molding ~~is a position but an inner wall surface~~ projects out of the communicating hole into the through-hole.

As described above, because ~~the position of~~ the burr to be generated in ~~the communicating hole of~~ the resin piston for a master cylinder ~~is the position but the inner wall surface~~ projects out of the communicating hole, the ~~bur~~ burr does not interfere with the movement of a stem inserted into the communicating hole. According to the first aspect of the invention, operation and an effect of the resin piston for a master cylinder ~~of the first aspect, operation and an effect~~ can be obtained such that it is prevented that the stem of the valve mechanism is caught by a burr that can be generated in the communicating hole of a resin piston for a master cylinder in the process of the injection molding to disable the valve mechanism from working.

A second aspect of the invention is a resin piston for a master cylinder including a through-hole through which a stopper pin, being a component of a valve mechanism of the master cylinder, is inserted, a concavity in which the valve mechanism is fixed by being inserted therein, and a communicating hole communicating with the through-hole from the concavity, the resin piston for a master cylinder being molded by injection of a resin material, wherein: the through-hole is molded with a core for through-hole molding; the concavity and the communicating hole are molded with a core for molding a concavity; and a part where the through-hole communicates with the communicating hole is molded in a state such that an end of the core for molding a concavity is impacted in an impact hole formed on the core for through-hole molding.

As described above, because the communicating part is molded in the state such that the end of the core for molding a concavity is impacted in an impact hole formed on the core for through-hole molding, a burr formed at the part where the communicating hole communicates with the through-hole is formed by the flow of the resin material into a gap between the end of the core for molding a concavity and the impact part. As a result, because the ~~bur~~ burr formed at

the part where the communicating hole communicates with the through-hole is formed in the shape of a protrusion into the through-hole along the inner wall surface of the communicating hole, the shape of the burr does not interfere with the movement of a stem inserted in the communicating hole. According to the second aspect of the invention, operation and an effect of the resin piston for a master cylinder ~~of the second aspect, operation and an effect~~ can be obtained such that it is prevented that the stem of the valve mechanism is caught by a burr that can be generated in the communicating hole of a resin piston for a master cylinder in the process of the injection molding to disable the valve mechanism from working.

A third aspect of the invention is the resin piston for a master cylinder as in the second aspect, wherein: the resin piston for a master cylinder is molded with a die formed by a combination of a first die and a second die, the first die including a first core, the second die including a second core; and the core for through-hole molding is constructed by a combination of the first core and the second core, whereby the impact hole is formed.

By the construction of the die for molding the resin piston for a master cylinder in such a way, it becomes possible to form the first die and the second die in a symmetrical shape. Thereby, according to the third aspect of the invention, operation and an effect of the resin piston for a master cylinder ~~of the third aspect, operation and an effect~~ can be obtained such that the manufacture of the die is made easy in addition to the operation and the effect of the resin piston for a master cylinder of the second aspect.

A fourth aspect of the invention is the resin piston for a master cylinder as in any one of the aspects 1-3, wherein ~~a groove making the inner wall surface nearby a part, with which the communicating hole communicates, of the through-hole flat in a direction in which the stopper pin is inserted.~~ a groove is provided in a portion of an inner wall surface of said through-hole, the groove facing said communicating hole, the groove being in the shape of a flat surface oriented in a direction substantially perpendicular to the longitudinal direction in which said stopper pin is travels in operation of said master cylinder.

By the formation of such a groove in the through-hole, the surface of the through-hole becomes a flat surface nearby the impact hole which is formed in the core for through-hole

molding and in which the core for molding a concavity is impacted. By the formation of the flat surface nearby the impact hole in such a way, the precision of the core for through-hole molding in the vicinity of the impact hole is easily heightened more than the case where the surface is a curved surface, and a burr generated in the vicinity of the impact hole can be made smaller than that in the case where the surface is a curved surface. Thereby, according to the fourth aspect of the invention, operation and an effect of the resin piston for a master cylinder ~~of the fourth aspect, operation and an effect~~ can be obtained such that burrs can be made small in addition to the operation and the effects of the resin piston for a master cylinder as in any one of the first to the third aspects.

A fifth aspect of the invention is the resin piston for a master cylinder as in the fourth aspect, wherein the width of the groove is narrower than that of the through-hole and wider than the diameter of the stopper pin.

By the formation of the width of the groove to be narrower than that of the through-hole and wider than the diameter of the stopper pin, the position of a reciprocation end of the resin piston for a master cylinder, the reciprocation width of which is regulated by the stopper pin inserted in the through-hole while the resin piston is reciprocating, becomes easy to adjust. Thereby, according to the fifth aspect of the invention, operation and an effect of the resin piston for a master cylinder ~~of the fifth aspect, operation and an effect~~ can be obtained such that the positioning of the reciprocation end of the resin piston for a master cylinder becomes easy in addition to the operation and the effects of the resin piston for a master cylinder as in the fourth aspects.

A sixth aspect of the invention is the resin piston for a master cylinder as in any one of the first to fifth aspects, wherein the through-hole includes a projecting part for preventing the stopper pin from being touched to the inner wall surface nearby a part with which the communicating hole communicates.

By the construction such that the stopper pin inserted in the through-hole is not touched to the inner wall surface nearby a part with which the communicating hole communicates, there are no possibilities that the stopper pin pushes the burrs generated at that part to bend them.

Thereby, according to the sixth aspect of the invention, operation and an effect of the resin piston for a master cylinder ~~of the sixth aspect, operation and an effect~~ can be obtained such that it can be prevented that the burrs that have been pushed and bent interfere with the stem of the valve mechanism inserted in the communicating hole to disable the valve mechanism from working in addition to the operation and the effects of the resin piston for a master cylinder as in any one of the first to the fifth aspects.

A seventh aspect of the invention is a resin piston for a master cylinder including a through-hole through which a stopper pin, being a component of a valve mechanism of the master cylinder, is inserted, a concavity in which the valve mechanism is fixed by being inserted therein, and a communicating hole communicating with the through-hole from the concavity, the resin piston for a master cylinder being molded by injection of a resin material, wherein: the through-hole is molded with a core for through-hole molding; the concavity and the communicating hole are molded with a core for molding a concavity; and an inner wall surface of the through-hole nearby a part where the communicating hole communicates with the through-hole is in a shape of a flat surface.

According to the resin piston for a master cylinder of the seventh aspect, the same operation and the same effect can be obtained as those of the resin piston for a master cylinder of the fourth aspect. Then, burrs can be made small regardless of the directions in which the burrs protrude.

An eighth aspect of the invention is a master cylinder equipped with the resin piston for a master cylinder as in any one of the first to the seventh aspects.

According to the master cylinder of the eighth aspect, such operation and an effect can be obtained as are brought about by the resin piston for a master cylinder as in any one of the first to the seventh aspects in the master cylinder.

A ninth aspect of the invention is a die for molding a resin piston for a master cylinder, the die molding a resin piston for a master cylinder, the resin piston for a master cylinder including a through-hole through which a stopper pin, being a component of a valve mechanism of the master cylinder, is inserted, a concavity in which the valve mechanism is fixed by being

inserted therein, and a communicating hole communicating with the through-hole from the concavity, the resin piston for a master cylinder being molded by the injection of a resin material, the die comprising a core for through-hole molding for molding the through-hole and a core for molding a concavity for molding the concavity and the communicating hole, wherein a part where the through-hole communicates with the communicating hole is constructed such that the part is molded in a state in which an end of the core for molding a concavity is impacted in an impact hole formed on the core for through-hole molding.

According to the ninth aspect of the invention, the same operation and the same effect can be obtained ~~resin piston~~ for a master cylinder molded by the injection molding with the die for molding a resin piston for a master cylinder ~~of the ninth aspect, the same operation and the same effect can be obtained~~ as those of the aforesaid resin piston for a master cylinder of the second aspect.

A tenth aspect of the invention is a ~~manufacturing~~ method of manufacturing a resin piston for a master cylinder ~~for manufacturing a resin piston for a master cylinder~~ including a through-hole through which a stopper pin, being a component of a valve mechanism of the master cylinder, is inserted, a concavity in which the valve mechanism is fixed by being inserted therein, and a communicating hole communicating with the through-hole from the concavity, the resin piston for a master cylinder being molded by the injection of a resin material, the manufacturing method comprising the steps of: molding the through-hole with a core for through-hole molding; molding the concavity and the communicating hole with a core for molding a concavity; and molding a part where the through-hole communicates with the communicating hole in a state such that an end of the core for molding a concavity is impacted in an impact hole formed on the core for through-hole molding.

According to the tenth aspect of the invention, the same operation and the same effect can be obtained for the resin piston for a master cylinder manufactured by the manufacturing method of a resin piston for a master cylinder ~~of the tenth aspect, the same operation and the same effect can be obtained~~ as those of the aforesaid resin piston for a master cylinder of the second aspect.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present invention will become more apparent from the following description of the presently preferred exemplary embodiments of the invention taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a plan view of the resin piston for a master cylinder of a first embodiment according to the present invention;

Fig. 2 is a sectional view along the I-I line in a state such that a valve mechanism is inserted in the resin piston for a master cylinder of Fig. 1 to be touched with the resin piston;

Fig. 3 is a sectional view showing the resin piston for a master cylinder of the first embodiment according to the preset invention and dies and cores for the injection molding of the resin piston for a master cylinder;

Fig. 4 is a sectional view showing the resin piston for a master cylinder of a second embodiment according to the preset invention and dies and cores for the injection molding of the resin piston for a master cylinder;

Fig. 5 is a plan view of the resin piston for a master cylinder of a third embodiment according to the preset invention;

Fig. 6 is a sectional view of the resin piston for a master cylinder of a fourth embodiment according to the preset invention; and

Fig. 7 is a sectional view showing a prior art resin piston for a master cylinder and dies and cores for the injection molding of the resin piston for a master cylinder.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, embodiments of the present invention are described by reference to the attached drawings.

Fig. 1 is a plan view of the resin piston for a master cylinder of a first embodiment according to the present invention; and Fig. 2 is a sectional view along the I-I line in a state such

that a valve mechanism is inserted in the resin piston for a master cylinder of Fig. 1 to be touched with the resin piston.

A resin piston for a master cylinder 1 is slidably impacted in the cylinder hole of a ~~not shown~~ master cylinder not shown. The valve mechanism 41 is equipped in the concavity 31 in the shape of a ~~circular~~ concave circle. The valve mechanism 41 opens and shuts the communication of fluid between a fluid pressure chamber of the ~~not shown~~ master cylinder, not shown, and an operation fluid reservoir. The communicating hole 32 is a circular hole having a diameter smaller than that of the concavity 31, and the communicating hole 32 makes the concavity 31 communicate with the through-hole 33. The through-hole 33 is an elongated hole formed in the central part in the axial direction of the resin piston for a master cylinder 1. The valve mechanism 41 includes the stem 42 inserted in the communicating hole 32, and the stopper pin 43 to which an end of the stem 42 can be touched and which is inserted in the through-hole 33. The valve mechanism 41, as being known, has a configuration to open the valve thereof by the touching of the end of the stem 42 to the stopper pin 43 owing to a push and a move of the resin piston for a master cylinder 1 caused by the operation of the master cylinder, and to close the valve by the separation of the end of the stem 42 from the stopper pin 43.

Fig. 3 is a sectional view showing the resin piston for a master cylinder 1 of the first embodiment according to the ~~preset~~ present invention, and dies and cores for the injection molding of the resin piston for a master cylinder 1.

The upper die 11 and the lower die 12 are combined, and the core for molding a concavity 13 and the core 14 are combined with the combined upper die 11 and the lower die 12 at respective prescribed positions. A core for through-hole molding 15 is constructed by the junction of the cores, which are ~~equipped to~~ provided for in the upper die 11 and the lower die 12 severally to be integrated, on the extension line of the central axis of the core for molding a concavity 13. The through-hole 33 is molded with the core for through-hole molding 15. The concavity 31 to be equipped with the valve mechanism 41 and the communicating hole 32, making the concavity 31 communicate with the through-hole 33, are molded with the core for molding a concavity 13. The core for through-hole molding 15 includes an impact hole 16, in

which a tip of the core for molding a concavity 13 is impacted. The upper die 11 and the lower die 12 severally have a symmetrical shape, and thereby the dies can easily be manufactured.

Then, a resin material is injected from the resin material injection hole 21 formed in the core 14 to mold the resin piston for a master cylinder 1. At this time, burrs, which are generated by the flow of the resin material into a slight gap between the impact hole 16 and the core for molding a concavity 13 at the communicating section 51 where the communicating hole 32 communicates with the through-hole 33, are molded in a state of a protrusion into the through-hole 33 along the communicating hole 32 as shown in the drawing. Consequently, no burrs are generated on the inner wall surface of the communicating hole 32.

Because the burrs molded in such a way at the communicating section 51 ~~in such a way~~ protrude into the through-hole 33 along the communicating hole 32, the burrs do not interfere with the operation of the stem 42 inserted in the communicating hole 32. Thereby, it can be prevented that the stem 42 is caught by the burrs molded at the communicating section 51 to disable the work of the valve mechanism 41.

Next, as a second embodiment according to the present invention, a resin piston for a master cylinder as shown in Fig. 4 can be ~~cited~~provided. In the resin piston of the second embodiment, the position of the junction surface of the core for through-hole molding 15, which is placed on the extension line of the central axis of the core for molding a concavity 13 in the first embodiment, is shifted from the extension line of the central axis of the core for molding a concavity 13.

Even if the core for through-hole molding 15 is thus constructed, the implementation of the present invention is possible. In this case also, because the burrs molded at the communicating section 51, likewise in the first embodiment, protrude into the through-hole 33 along the communicating hole 32, the burrs do not interfere with the movement of the stem 42 that is inserted in the communicating hole 32. Then, it is possible to prevent the stem 42 from being caught by the burrs, molded at the communicating section 51, to disable the operation of the valve mechanism 41.

Furthermore, as a third embodiment according to the present invention, a resin piston for a master cylinder as shown in Fig. 5 is ~~cited~~provided. In the resin piston of the third embodiment, a groove 34 is formed in addition to the form of the first embodiment or the second embodiments. The groove 34 is formed in such a way that the inner wall surface of the through-hole 33 becomes flat at a part thereof nearby a position where the communicating hole 32 communicates with the through-hole 33 in the direction of the insertion of the stopper pin 43.

By the provision of such a groove 34 for the through-hole 33, a surface of the through-hole 33 is made flat nearby the impact hole 16 which is formed in the core for through-hole molding 15 and in which the core for molding a concavity 13 is impacted. Then, the flat formation of the surface of the through-hole 33 nearby the impact hole 16 makes it easier to heighten the precision of the core for through-hole molding 15 nearby the impact hole 16 than in a case where the surface is a curved surface. Consequently, burrs to be generated nearby the impact hole 16 can be smaller in comparison with the case where the groove 34 is not formed and the surface of the through-hole 33 nearby the impact hole 16 is a curved surface. Moreover, because the inner wall surface of the through-hole 33 becomes flat nearby a position where the communicating hole 32 communicates, the contact area where burrs ~~formed~~ form is in such a state ~~such~~ that they protrude into the through-hole 33 and the radiused surface of the stopper pin 43 becomes small when the radiused surface of the stopper pin 43 is touched to the part of the through-hole 33 where the communicating hole 32 communicates with the through-hole 33.

Consequently, it can be prevented that the stem 42 is caught by the burrs, molded at the communicating section 51, to disable the work of the valve mechanism 41. Moreover, the following possibility becomes small. That is, the stopper pin 43 pushes and bends the burrs, and the burrs that have been pushed and bent catch the stem 42 inserted into the communicating hole 32. Moreover, because the surface of the through-hole 33, to which the stopper pin 43 inserted into the through-hole 33 is touched, is a flat surface, the operation and the effect can also be obtained such that the positioning of the reciprocation end of the reciprocating resin piston for a master cylinder 1 can be performed more correctly when the position of the reciprocation end is set while the reciprocation width of the resin piston 1 is regulated by the stopper pin 43.

Furthermore, as a fourth embodiment according to the present invention, a resin piston for a master cylinder is ~~cited~~provided. The resin piston of the fourth embodiment is equipped with a projecting part 35 for preventing the stopper pin 43 from being touched to the inner wall surface of the through-hole 33 at a part thereof nearby a position where the communicating hole 32 communicates with the through-hole 33 in addition to the form of any one of the first to third embodiments.

Fig. 6 is a sectional view of the resin piston for a master cylinder of the fourth embodiment according to the present invention. By the provision of the projecting part 35 on the inner wall surface of the through-hole 33, the stopper pin 43 is not touched to the burrs generated at the communicating section 51.

Thereby, it is prevented that the stem 42 is caught by the burrs, molded at the communicating section 51, to disable the work of the valve mechanism 41, and furthermore there are no possibilities that the stopper pin 43 pushes and bends the burrs and then the burrs that have been pushed and bent catch the stem 42 inserted into the communicating hole 32.

Furthermore, the present invention is not limited to the aforesaid embodiments, and obviously many changes and variations are possible therein without departing from scope and the sprit of the invention described in the claims. It is therefore needless to say that the changes and variations are within the present invention.

What is claimed is:

1. A resin piston for a master cylinder comprising: a through-hole through which a stopper pin being a component of a valve mechanism of said master cylinder is inserted, a concavity in which said valve mechanism is fixed by being inserted therein, and a communicating hole communicating with said through-hole from said concavity, said resin piston for a master cylinder being molded by injection of a resin material; and

a burr generated by a flow of said resin material into a gap between a combined molding die and a core in a process of molding of said resin piston by injection molding, said burr projecting out from said communicating hole into the through-hole.

2. The resin piston for a master cylinder ~~as in~~ of claim 1, wherein a groove ~~making said~~ is provided in a portion of an inner wall surface of said through-hole, the groove facing ~~nearby a part, with which~~ said communicating hole, ~~communicates, of said through-hole~~ the groove being in the shape of a flat surface oriented in a direction substantially perpendicular to the longitudinal direction in which said stopper pin ~~is inserted~~travels in operation of said master cylinder.

3. The resin piston for a master cylinder as in claim 2, wherein a width of said groove is narrower than that of said through-hole and wider than a diameter of said stopper pin.

4. The resin piston for a master cylinder ~~as in~~ of claim 1, wherein said through-hole includes a projecting part for preventing said stopper pin from being touched to ~~the inner wall surface nearby a part with which~~ said resin piston near said communicating hole ~~communicates~~.

5. ~~A~~ The resin piston for a master cylinder of claim 1, ~~comprising:~~

~~a through-hole through which a stopper pin being a component of a valve mechanism of said master cylinder is inserted, a concavity in which said valve mechanism is fixed by being inserted therein, and a communicating hole communicating with said through-hole from said concavity, said resin piston for a master cylinder being molded by injection of a resin material,~~

wherein said through-hole is molded with a core for through-hole molding;

said concavity and said communicating hole are molded with a core for molding a concavity; and

a ~~part~~ portion of said resin piston where said through-hole communicates with said communicating hole is molded in a ~~state~~ manner such that an end of said core for molding ~~a~~ said concavity is impacted in an impact hole formed ~~on~~ in said core for through-hole molding to produce a burr ~~that projects~~ projecting out from the communicating hole ~~to~~ into the through-hole.

6. The resin piston for a master cylinder as in claim 5, wherein:

said resin piston for a master cylinder is molded with a die formed by a combination of a first die and a second die, the first die including a first core, the second die including a second core; and

said core for through-hole molding is constructed by a combination of the first core and the second core, whereby said impact hole is formed.

~~7. The resin piston for a master cylinder as in claim 5, wherein a groove making said inner wall surface nearby a part, with which said communicating hole communicates, of said through-hole flat in a direction in which said stopper pin is inserted.~~

~~8. The resin piston for a master cylinder as in claim 7, wherein a width of said groove is narrower than that of said through-hole and wider than a diameter of said stopper pin.~~

~~9. The resin piston for a master cylinder as in claim 5, wherein said through-hole includes a projecting part for preventing said stopper pin from being touched to the inner wall surface nearby a part with which said communicating hole communicates.~~

10. ~~A~~ The resin piston for a master cylinder of claim 5, ~~comprising:~~

~~a through-hole through which a stopper pin being a component of a valve mechanism of said master cylinder is inserted, a concavity in which said valve mechanism is fixed by being inserted therein, and a communicating hole communicating with said through-hole from said concavity, said resin piston for a master cylinder being molded by injection of a resin material,~~

wherein said through-hole is molded with a core for through-hole molding; said concavity and said communicating hole are molded with a core for molding a concavity; and a groove is provided in a portion of an inner wall surface of said through-hole, ~~nearby a part where~~

the groove facing said communicating hole, ~~communicates with said through-hole~~ the groove being ~~is~~ in ~~a~~ the shape of a flat surface oriented in a direction substantially perpendicular to the longitudinal direction in which said stopper pin travels in operation of said master cylinder.

11. A master cylinder equipped with a resin piston for said master cylinder, said resin piston for a master cylinder comprising:

a through-hole through which a stopper pin being a component of a valve mechanism of said master cylinder is inserted, a concavity in which said valve mechanism is fixed by being inserted therein, and a communicating hole communicating with said through-hole from said concavity, said resin piston for a master cylinder being molded by injection of a resin material,

~~wherein~~ a burr ~~is~~ generated by a flow of said resin material into a gap between a combined molding die and a core in a process of molding of said resin piston for a master cylinder by injection molding, ~~and~~ said burr ~~projects~~ projecting out from said communicating hole into the through-hole.

12. ~~A~~ The master cylinder of claim 11, ~~equipped with a resin piston for said master cylinder, said resin piston for a master cylinder comprising:~~

~~a through-hole through which a stopper pin being a component of a valve mechanism of said master cylinder is inserted, a concavity in which said valve mechanism is fixed by being inserted therein, and a communicating hole communicating with said through-hole from said concavity, said resin piston for a master cylinder being molded by injection of a resin material,~~ wherein said through-hole is molded with a core for through-hole molding; said concavity and said communicating hole are molded with a core for molding a concavity; ~~a part~~ and a portion of said resin piston where said through-hole communicates with said communicating hole is molded in a ~~state~~ manner such that an end of said core for molding ~~a~~ said concavity is impacted in an impact hole formed ~~on~~ in said core for through-hole molding to produce a burr projecting out from the communicating hole into the through-hole.

13. ~~A~~ The master cylinder of claim 11, ~~equipped with a resin piston for said master cylinder, said resin piston for a master cylinder comprising:~~

~~a through-hole through which a stopper pin being a component of a valve mechanism of said cylinder is inserted, a concavity in which said valve mechanism is fixed by being inserted therein, and a communicating hole communicating with said through-hole from said concavity, said resin piston for a master cylinder being molded by injection of a resin material,~~ wherein said through-hole is molded with a core for through-hole molding; said concavity and said communicating hole ~~communicates~~ are molded with a core for molding a concavity; and

a groove is provided in a portion of an inner wall surface of said through-hole, ~~nearby a part where~~ the groove facing said communicating hole, ~~communicates with said through-hole is~~ the groove being in ~~a~~ the shape of a flat surface oriented in a direction substantially perpendicular to the longitudinal direction in which said stopper pin travels in operation of said master cylinder.

14. A die for molding a resin piston for a master cylinder, ~~said die molding a resin piston for a master cylinder,~~ said resin piston for a master cylinder comprising:

a through-hole through which a stopper pin being a component of a valve mechanism of said master cylinder is inserted, a concavity in which said valve mechanism is fixed by being inserted therein, and a communicating hole communicating with said through-hole from said concavity, said resin piston for a master cylinder being molded by injection of a resin material, said die comprising a core ~~for through-hole molding~~ for molding said through-hole and a core for molding ~~a concavity for molding~~ said concavity and said communicating hole, wherein ~~a part~~ said die is so constructed such that a portion of said resin piston where said through-hole communicates with said communicating hole ~~is constructed such that the part~~ is molded in a ~~state in which~~ manner such that an end of said core for molding ~~a~~ said concavity is impacted in an impact hole formed ~~on~~ in said core for through-hole molding to produce a burr projecting out from the communicating hole into the through-hole.

15. A ~~manufacturing~~ method ~~of a resin piston for a master cylinder~~ for manufacturing a resin piston for a master cylinder, comprising the steps of:

providing a through-hole through which a stopper pin being a component of a valve mechanism of ~~said~~ a master cylinder is inserted~~,~~;

providing a concavity in which said valve mechanism is fixed by being inserted therein, ~~and~~ providing a communicating hole communicating with said through-hole from said concavity, said resin piston for a master cylinder being molded by injection of a resin material;~~, said manufacturing method comprising:~~

molding said through-hole with a core for through-hole molding;

molding said concavity and said communicating hole with a core for molding a concavity; and

molding a ~~part~~ portion of said resin piston where said through-hole communicates with said communicating hole in a ~~state~~ manner such that an end of said core for molding ~~a~~ said concavity is impacted in an impact hole formed ~~on~~ in said core for through-hole molding to produce a burr projecting out from the communicating hole into the through-hole.

ABSTRACT

An upper die and a lower die are combined. A core for molding a concavity and another core are combined with the combined upper die and the lower die at respective prescribed positions. A core for through-hole molding is constructed by the junction of cores that are severally formed with the upper die and the lower die integrally on the extension line of the central axis of the core for molding a concavity. A through-hole is molded with the core for through-hole molding. A concavity in which a valve mechanism is equipped and a communicating hole through which the concavity communicates with the through-hole are molded with the core for molding a concavity. The core for through-hole molding includes an impact hole, in which a tip of the core for molding a concavity is impacted.